情報理工学部　SN コース 3 回
ワイヤレス通信システム
11th Week レポート

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1 ４章 演習問題 問 2

$$V_1 = Z_{11}I_1 + Z_{12}I_2 + Z_{13}I_2 \tag{1}$$
$$0 = Z_{21}I_1 + Z_{22}I_2 + Z_{23}I_2 \tag{2}$$
$$0 = Z_{31}I_1 + Z_{32}I_2 + Z_{33}I_2 \tag{3}$$

(1)(2)(3) の両辺を I_1 で割ると

$$Z_{in} = \frac{V_1}{I_1} = Z_{11} + \frac{I_2}{I_1}Z_{12} + \frac{I_3}{I_1}Z_{13} \tag{4}$$

$$Z_{21} + \frac{I_2}{I_1}Z_{22} + \frac{I_3}{I_1}Z_{23} = 0 \tag{5}$$

$$Z_{31} + \frac{I_2}{I_1}Z_{32} + \frac{I_3}{I_1}Z_{33} = 0 \tag{6}$$

(4)(5)(6) において

$$Z_{21} = Z_{12}$$
$$Z_{31} = Z_{13}$$
$$Z_{32} = Z_{23}$$

であり、$\frac{I_2}{I_1} = A, \frac{I_3}{I_1} = B$ とすると

$$Z_{in} = Z_{11} + AZ_{12} + BZ_{13} \tag{7}$$
$$Z_{12} + AZ_{22} + BZ_{23} = 0 \tag{8}$$
$$Z_{13} + AZ_{23} + BZ_{33} = 0 \tag{9}$$

となる、よって式 (8)(9) を解けば良い。
式 (8) より

$$B = -\frac{Z_{12} + AZ_{22}}{Z_{23}} \tag{10}$$

(10) を (9) に代入すると

$$Z_{13} + AZ_{23} - \frac{Z_{12} + AZ_{22}}{Z_{23}}Z_{33} = 0$$
$$(Z_{23} - \frac{Z_{22}Z_{33}}{Z_{23}})A = \frac{Z_{12}Z_{33}}{Z_{23}} - Z_{13}$$
$$A = \frac{Z_{12}Z_{33} - Z_{13}Z_{23}}{Z_{23}^2 - Z_{22}Z_{33}} \tag{11}$$

(10) と (11) より

$$B = -\frac{Z_{12}}{Z_{23}} - \frac{Z_{22}}{Z_{23}}\left(\frac{Z_{12}Z_{33} - Z_{13}Z_{23}}{Z_{23}^2 - Z_{22}Z_{33}}\right)$$
$$= -\frac{1}{Z_{23}}\left(Z_{12} + \frac{Z_{12}Z_{22}Z_{33} - Z_{13}Z_{22}Z_{23}}{Z_{23}^2 - Z_{22}Z_{33}}\right)$$
$$= -\frac{Z_{12}Z_{23} - Z_{13}Z_{22}}{Z_{23}^2 - Z_{22}Z_{33}} \tag{12}$$

(7)(11)(12) より

$$Z_{in} = Z_{11} + \frac{Z_{12}Z_{33} - Z_{13}Z_{23}}{Z_{23}^2 - Z_{22}Z_{33}}Z_{12} - \frac{Z_{12}Z_{23} - Z_{13}Z_{22}}{Z_{23}^2 - Z_{22}Z_{33}}Z_{13}$$
$$= Z_{11} + \frac{Z_{12}^2 Z_{33} + Z_{13}^2 Z_{22} - 2Z_{12}Z_{13}Z_{23}}{Z_{23}^2 - Z_{22}Z_{33}}$$

2　4章 演習問題 問3

軸比が 1 の時、円編波となるので

$$|E_\theta| = |E_\phi|$$

教科書式 (4・13) より

$$\lambda S = 2\pi^2 a^2$$
$$S = \frac{2\pi^2 a^2}{\lambda}$$
$$= \frac{2 \times 3.1415 \times 4.5}{\frac{299792458}{1100}}$$
$$= 1.46$$

よって、ピッチ S が 1.46mm の時、円偏波となる。